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ABSTRACT

A description is given of an ongoing collaborative research effort consisting of a series of studies with 3- to 5-year-old children, designed for the purpose of: (1) identifying factors contributing to motor learning/performance during the development years, i.e., psychological, sociological, and experiential variables; (2) determining the relationship between perceptual-motor attributes and acquisition of skill in perceptual-motor tasks with different environmental and movement demands; and (3) determining factors which help improve perceptual-motor attributes and/or facilitate skill acquisition. This examination of the learning/performance of "real world" perceptual-motor tasks is approached from the perspective of theory into practice, or the application of knowledge to useful ends. The ultimate goal of the study is to be able to test the 1- to 15-year longitudinal effects of: intervention techniques, methods of instruction, and a motor development program for children when these interventions are introduced to 3- to 5-year olds. A review of literature on research findings by motor development experts is presented, and a description is given of intended interventions and research methodology to be used. A bibliography is included. (JD)

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PRACTICAL RESEARCH IN MOTOR DEVELOPMENT/LEARNING

Patricia A. Beitel & Barbara J. Mead

An invited paper presented at the
Preconference Research Symposium
of the
Southern District of the American Alliance for Health,
Physical Education, Recreation, and Dance

Little Rock, Arkansas

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According to Webster the definition of "practical" is that which is concerned with the application of knowledge to useful ends. Dr. Barbara Mead and I have tried to approach the learning/performance of "real world" perceptual-motor tasks from the perspective of "theory-into-practice," or "the application of knowledge to useful ends." We bring two different backgrounds to our collaborative research efforts. Dr. Mead has the background expertise in perceptual-motor development beginning with her Ph.D. from Purdue University, while I have a background of motor behavior and measurement beginning with an M.S. from the University of Wisconsin at Madison and Ed.D. from the University of North Carolina at Greensboro. Dr. Mead's individual scholarly work is in perceptual-motor development and in pedagogy as related to preschool and elementary physical education. My individual work is in motor behavior/sport psychology with specific focus on factors which facilitate sport learning and/or performance.

Our collaborative research program consists of a series of studies with 3- to 5-year-old children designed for the purpose of: (a) identifying factors contributing to motor learning/performance during the developmental years, i.e., psychological, sociological, and experiential variables; (b) determining the relationship between perceptual-motor attributes and acquisition of skill in perceptual-motor tasks with different environmental and movement demands, and (c) determining factors which help improve perceptual-motor attributes

and/or facilitate skill acquisition. Both education and child development experts have indicated the need for this approach.

Motor development experts such as Corbin (1980), Cratty (1979, 1986), and Gallahue (1982, 1989), are in general accord that many family, societal, and environmental factors have an early and significant effect upon the motor development of children. Cratty (1979, 1986) suggests that parent attitudes, rearing practices, and motor behavior patterns are important influences. Gallahue (1982, 1989) stresses the importance of the quality and variety of the child's movement experiences upon motor development, and Malina (1980) points to the significant effects of the child's family, siblings, peer groups, ethnic group, and socioeconomic background. He states that for preschool children ". . . the effects of these conditions and related factors on motor development have gone largely unexamined" (Malina, 1980, p. 212).

Individual differences among learners also constitute an important class of variables for research on learning. The study of individual difference variables, often called abilities, aptitudes, attributes, or traits, have been of interest as factors which interact with instructional conditions (Berliner & Cahen, 1973; Cronbach & Snow, 1977; and Snow, 1977). "Abilities" have been defined as characteristics more or less stable and unaffected by learning, while "attributes" are characteristics that are affected by experience and learning. Cronbach & Snow conclude that research has demonstrated the existence of attribute-treatment-interaction (ATI) phenomena.

It has been shown by Fleishman, 1954; Gentile, 1972; and Beitel, 1980b; that different task demands and learning stages entail different

perceptual abilities. Thus, task characteristics should also be included in future learning research creating Attribute-Treatment-Task-Interaction (ATTI) designs (Cronbach & Snow, 1977). ATTI research is especially appropriate during the early childhood years (2-6) since there are inconsistencies in the literature concerning: (a) gender differences and/or (b) environmental factors related to perceptual-motor attributes. Little is known about the interaction of these attributes with sequentially presented tasks designed to enhance movement proficiency (Corbin, 1980; Eckert, 1987; Espenschade and Eckert, 1980).

Our ultimate goal is to be able to test the 1- to 15-year longitudinal effects of: (a) intervention techniques, (b) methods of instruction, and/or (c) a motor development program for children when these interventions are introduced to 3- to 5-year-olds. In order to accomplish this task, we have established a basic framework which includes identification of the means of evaluating: (a) developmental attributes, (b) relevant demographic information, (c) the nature of tasks, and (d) the separation of development and learning.

In order to evaluate the perceptual-motor attributes of children across a wide age range, i.e., three years to near adult, we searched through a wide range of existent measures. We decided that the Bruininks/Oseretsky Test of Motor Proficiency (1978) had the potential for studying the greatest range of attributes, and had norms already established for ages 4.5 to 17 years. We have completed a series of studies with 3- to 5-year-old children using the Bruininks/Oseretsky test which established reliability and no gender differences. Two articles have been published reporting this information (Beitel & Mead,

1980, 1982). We are working to collect enough information to establish norms for the 3-, 3.5-, and 4-year-old subgroups.

The attribute information available from the Bruininks/Oseretsky includes:

A. Gross Motor Composite and Subtests

1. Running speed and agility
2. Balance -- both static and dynamic
3. Bilateral coordination -- hands, feet, and combination
4. Strength -- arms, legs, and trunk

B. Upper Limb Coordination -- eye/hand for projection/reception

C. Fine Motor Composite and Subtests

1. Response speed (coincidence anticipation) -- reaction time to a moving object in relation to effect of gravity
2. Visual motor control
3. Upper limb speed and dexterity -- fine motor manipulation.

Based on a literature review, the demographic information which may be related to perceptual-motor development/learning was divided into two broad categories: (a) sociological considerations and (b) experiential considerations. The sociological considerations include items such as area of the country, size, and type of community and neighborhood; political and religious orientation; education and occupation of parents; sibling order; and the number and gender of siblings. The experiential considerations include such elements as the type and level of activity of parents, siblings, and child; what the child plays with; type of play or activity areas available indoors and outdoors; and who plays what types of activities with the child.

The Mead-Beitel Demographic Profile of Motor Development (1980) consists of two questionnaires: (a) Family, and (b) Individual

Child. Logical validity and test-retest reliability of the questionnaires have been established, and we are working on construct validation. Family data can be collected once a year, coded, and then matched to the information for each child in the family. Data collected over a three-year period via the Demographic Profile (Mead & Beitel, 1980) are currently being analyzed. These data will provide evidence of the interaction of sociological and experiential variables of parents and their 3- to 5-year-old children. We have collected demographic and motor development attribute data for the purpose of determining the interrelationship of these variables for 3- to 5-year-old children during a three-year time span.

In addition, we initiated a series of cross-cultural studies with Dr. Arlene Morris while she was on the faculty at the University of Arizona: (a) one to replicate the verification studies on the Bruininks/Oseretsky Test of Motor Proficiency, (b) one to investigate potential cross-cultural differences in the interaction of the sociological and/or cultural factors of parents and their 3- to 5-year-old children, and (c) one to evaluate cross-cultural differences in the relationships of demographic variables and motor development attributes.

The nature of tasks has been shown by Beitel (1980b) and Del Rey (1972) to be a critical component in research with adults. Further, in two studies by Beitel (1980a, 1983) and two studies by Barbara Mead with Craig Wrisberg (1981, 1983) it was shown that the learning/performance of tasks with varied demands is differentially affected by types of treatment and by experiential variables (Beitel, 1980a, 1980b; Del Rey, 1972). The Gentile/Higgins (Higgins, 1977)

framework for categorizing perceptual-motor tasks was selected because it focuses on both movement demands (motor orientation) and enviromental demands (visual perceptual orientation).

In the development of a variety of learning tasks for children, our considerations include: (a) having tasks representative of each cell in the Gentile/Higgins model; (b) insuring that the tasks are possible and challenging for the age groups being tested; and (c) varying the degree of difficulty as suggested by Herkowitz (1978).

Following learning task development, appropriate assessment techniques are being determined based on Higgin's (1972) suggestion that movements match environmental demands. He stated that acquisition of skill can be observed from two vantage points: (a) goal attainment, and (b) movement to accomplish the goal. Evaluation of goal attainment is reflected best by the combination of effectiveness and consistency. In learning/performance studies the average block score could be used to represent effectiveness, and the standard deviation for the block could be used to represent consistency. Evaluation of movement used to accomplish the goal is reflected best by the consistency of movement (Higgins, 1972). I suggest that the nature of the movement, rhythmic structure, coordination, or pattern of movement to accomplish the task is also important. These types of variables necessitate the use of some type of visual record of each performance (i.e., video tape or motion picture) for later evaluation. The speed and clarity of the visual record are related to the speed and specificity needs of the task.

This task aspect of the investigation of ATTI during developmental years is what we feel makes the research we are doing

"practical," i.e., applies knowledge to useful ends, the "real world" tasks. Of course, that is why it takes a long time to develop these types of tasks and the appropriate evaluation techniques. We have a good deal of research based on error models, i.e., AE, VE, CE. We have learned some things from this research, one of which is that error models and lab task measures are not the only viable and valid assessment techniques, nor are they necessarily reflective of the important elements for all types of tasks.

The culminating and critical issue of our research paradigm is the selection of theoretically based intervention techniques. Dr. Mead, in 1972, developed a program of theoretically based objectives and methods to facilitate perceptual-motor development at The University of Tennessee, Knoxville. She brought the conceptualization of this program from the nationally known program which she initiated and directed at Purdue. The Purdue program gained prominence under the subsequent directorship of Dr. Marguerite Clifton. Dr. Mead has continued to evaluate and revise the model and add innovations over the years. Concentration on perceptual factors developed through activities includes elements such as the following (Mead, 1980a).

1. Body Image
    - 1.1 Identification of body parts
    - 1.2 Knowledge of body size
2. Space Perception
    - 2.1 Self-space (space required by own body)
    - 2.2 Shared space (space available for own movement and that of others)

3. Visual Perception
    3.1 Observational ability
    3.2 Visual memory
    3.3 Visual tracking
4. Auditory Perception
    4.1 Auditory awareness and memory
    4.2 Using sound cues to refine movement performance
5. Proprioception (tactile, deep pressure, vestibular, kinesthetic perception)
    5.1 Proprioceptive awareness
    5.2 Proprioception to guide movement

Dr. Mead (1980) used an adaptation of Laban's movment analysis framework as the basis for developing the motor experiences and includes in her program aspects such as the following.

1. Body Awareness (What the Body Can Do)
    1.1 Actions of the Body
    1.2 Locomotor Skills
    1.3 Nonmanipulative Skills
    1.4 Manipulative Skills
2. Space Awareness (Where the Body Can Move)
    2.1 Location
    2.2 Direction
    2.3 Level
    2.4 Pathway
    2.5 Extension

3. Effort Qualities (How the Body Can Move)

3.1 Time

3.2 Rhythm

3.3 Force

3.4 Flow

4. Relationships (With What or With Whom the Body Can Move)

4.1 Body Parts to Each Other

4.2 Children to Each Other

4.3 Children to Each Other and/or to Equipment

We are planning to test program effectiveness using longitudinal, cohort, and sequential ATTI designs. We also plan to test varied focused attention methods at different age and experience levels using a cohort design. In both instances, socioeconomic, experiential, and physical factors will be controlled.

Practical research in motor development will be gererated by utilization of the ATTI approach to: (a) answering motor development questions linked to longitudinal/cohort techniques, (b) following sound evaluation principles (validity/reliability) in determining task measures, and (c) basing the research questions and intervention techniques in theoretical frameworks. This approach may help answer some of the questions about status vs. change, and/or developmental state/phase vs. learning.

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